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15.

**Dud Dudley's**

*Mettallum Martis:*

1665.

Econ 214.5



**Harvard College Library.**

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FROM THE BEQUEST OF

**FRANCIS B. HAYES**

(Class of 1839)

This fund is \$10,000 and its income is to be used  
"For the purchase of books for the Library"

Mr. Hayes died in 1884

Insp. Muirhead.

—

**Dud Dudley's**

*Mettallum Martis :*

OR,

**I R O N**

MADE WITH

**Pit-coale,**

**Sea-coale,**

**&c.**

And with the same Fuell to Melt and  
Fine Imperfect Mettals, and Refine  
perfect Mettals.

LONDON, Printed by T. M. for the Authour.  
1665.

Econ 214.5

Hayes, Fred

The Reader is informed that this work is an *exact* re-print, and that obvious errors in spelling as well as grammar have been literally followed.

good family. He himself informs us that he was an undergraduate of Balliol College, Oxon, and that he left early, in order to manage his father's Iron works at Pensnett. The reader cannot

*The Publisher to the Reader.*

The "*Metallum Martis*," printed in the year 1665, of which the following pages are a faithful reprint, became so scarce, in a few years, that very few copies of it could be met with. The Publisher having been fortunate enough to obtain a copy, through the kindness of a friend, was so interested in its perusal, giving, as it does, a full account of the state of the Iron Trade at the time it was written, and also shewing the great difficulties which had to be surmounted before coal could be applied to the purposes of smelting and manufacturing Iron, that he was induced to republish it, especially as a wish had been expressed by several Ironmasters to possess the work.

Very little is known of the Author, Dud Dudley, but he is generally supposed to have been related to Lord Dudley. Dr. Plot, who quotes largely from the "*Metallum Martis*," styles him the "*Worshipful Dud Dudley*," which would induce the belief that he was of a good family. He himself informs us that he was an undergraduate of Balliol College, Oxon, and that he left early, in order to manage his father's Iron works at Pensnett. The reader cannot



fail to remark how strongly impressed his mind was with the belief that the men of his age were on the eve of greater and more wonderful discoveries, "by working of mines and fusion of metals," which no doubt served as an incentive to perseverance in the important object he had in view, in spite of the ceaseless opposition to which he was exposed; a conviction which has been so fully realized in our day.


J. N. B.

West Bromwich, March, 1851.

TO THE  
**K I N G S**

**Most Sacred Majesty.**

*May it Please Your Majesty,*

 *All Your Kingdoms, Dominions, and Territories, being the happy Subjects of Your Cares, are therefore the proper Objects of Your View: Great Brittain, O Great Brittain, Your Principal Island, here Humbly Presents her self unto Your Royall Presence, View and Care; be Pleased, to interpret this her Obsequiousness, to be her Duty; for since Your Majesties safe Return, has already*

*A 2* *Graciously*

*Graciously dayned, to View, and often to review her Shipings, Stores, Armories, Ordnance, Magazines, and Trade; Vouchsafe, Great Sir, Great Brittain Your Royal Patronage, and once more, at some one hour, or two, to Grace it with Your Auspicious Aspect, in this Mite, with all Humility Presented, By,*

A Faithful Servant, of Your Sa-

cred Fathers; And a Loyal

Sufferer, for Your Sacred

Majesty; And by

Pattent-Servant,

***Dud Dudley.***

T O T H E  
**Honourable, His Maje-**  
sties Great Council,

*The High Court of Parliament.*

**Y** Our Predecessors in former Ages, had both serious Consultations, and Considerations, before they made those many Wholesome and Good Lawes, for the Preservation of Wood, and Timber, of this Kingdome, 1 *Eliz.* 15. 23 *Eliz.* 5. 27 *Eliz.* 19. 28 *Eliz.* 3. 5. in whose dayes, and since in King *James's* Reign, Ships in most Ports and Rivers of this Kingdom, (*Thames* Excepted) might have been built, for forty Shillings *per* Tunn; but now they can hardly be built for treble the value, wood and timber is so much decayed; therefore men of War, Trade of Merchants, of Fishing, of Navigating, unto Plantations will decay, if not timely prevent-

*The Epistle.*

ed, which is hoped will be one of Your Principallest Cares, seeing our Enemies have carried Timber from *England*, and the Iron Works have much exhausted it; For the prevention of so great a Consumption, almost incureable: First is to put the Wholesome Laws in Execution; Secondly, not to permit Timber to be Exported. Thirdly, to animate, as King *James* did, and also Prince *Henry*, the making of Iron in *England*, *Scotland*, and *Wales* with Pit-cole, Sea-cole, and Peate; which if the Authour (who had a Pattent for it) had not been opposed, after he had made much good Iron with Pit-cole, it had long since, by his Inventions, been fully perfected. The Fourth is, to stop all the Exportation of Pit-cole, and Sea-cole (paying His Majesties Duty) if the Cole be in a fit place, to make Iron therewith. Fifthly, That the Authour, or his Agents may have power to preserve many thousand Tuns of Pit-cole, which are annually destroyed, for ever in *England*, *Scotland*, and *Wales*, which are fit to make Iron;  
and

*The Epistle.*

and the Authour in this Treatise hath demonstrated it, being moved with pittie, seeing his Native Country decaying, Humbly offers but his Judgement, and leaves the grave consideration thereof, to your Learned, and more serious Consultations and Actings, praying that you may animate good things, and new inventions, that may bring unto His Sacred Majesty, and all Loyal Subjects, Safety, Strength, Wealth, and Honour by our Ships, and Men of War, Fishing, Navigation, and Merchandizing, unto Foreign Nations; but more especially, to and from the Territories of *Great Britain*, our *North Indies* abounding in *Mines* and *Minerals*, that they that are of the Honourable Corporations of *Mines Royal*, and *Batteries*, or any others, would lay in a Common, or Joynt Stock, fully to set the *Mines* at Work, by imploying our idle, and burdensom supernumerary people therein, *Iron, Tin, Lead, Copper, Quick-silver, Silver* and *Gold*, besides many other *Minerals*, and *Marcesit's, Lapis Calaminaris*

*The Epistle.*

*minaris, Antimonie, Maganes, &c. also many Mineral Earths and Precious Stones :*

✓ Did I call *Great Brittain* our *North Indies* ? give me leave to repeat a passage till further satisfaction, of King *Josina* of *Scotland*, a great Phylosopher, Physitian, and Herbalist, living before Christ, 161 years, at which time, two venerable Phylosophers and Priests passing from *Portu-gall* to *Athens*, their Ship and Company, and Marriners, all perished at *Ros*, they only saved ; after refreshing, and good Entertainment, the King desired of them what they understood by their Science of the Nature of the Ground of *Scotland* ; after deliberate advisement, said, *There was more Riches and Profit to be gotten within the Veins of the Earth of Scotland, then above, for the winning of Mines and Metals ; They knew this by the Influence of the Hea-vens :* This you may see in the *Chronicles of Scotland*.

My Dear Master, our Sacred Martyr, *Charles* the First of ever Blessed Memory, did animate the Authour by Granting him  
him

*The Epistle.*

him a Pattent, *Anno* 14 of His Reign, for the making of Iron, and Melting, Smelting, Extracting, Refining, and Reducing all Mines and Metals with Pit-cole, Sea-cole, Peat and Turf, which was Extinct, and Obstructed by reason of the War; and had not this unnatural and unparallel'd War been, His late Sacred Majesty himself had set at work many of His Mines, and much good had been produced to *Great Brittain* before this time.

At present, the Authour is in good hope, and incessantly prays, that the Mines be set at work in his dayes, by the Honourable Corporation of the Mines Royal, for he verily believeth the time to be near, when the Omnipotent God, before he Judge the World in Fire, will shew His Omnipotency unto the *Nations*, by revealing of the wonderful and incredible things of Nature, of which the Learned do believe very many to be, in the Mineral Kingdome, by working of Mines and Fusion of Metals, gotten by honest labour under ground, profitable to Man, and Acceptable with God. I



### *The Epistle.*

I might here speak somewhat of Superiour Planets producing Metal, *Saturn*, Lead: *Iupiter*, Tin: *Mars*, Iron: but these abound in *Great Brittain*, so do the Inferiour Planets produce *Venus*, Copper: *Mercury*, Quicksilver: *Luna*, Silver.

If God permit me health and leasure from Sutes and Troubles, not onely to write of them, but also the manner of the Melting, Extracting, Refining, and Reducing of them with Pit-cole, Sea-cole, Peat, &c. In the interim to let you know that *Great Brittain* abounds with *Copper Mines*, much neglected, yet of great use for Ordnance, at Land, and also at Seas, and for the making of Brass, with our *Lapis Calaminaris*, so much Exported by the *Dutch*, which doth hinder our manufactories of Brass, and causes the *Dutch* and *Swedes* to raise the price of Copper and Brass ever since our small loss at Sea by the *Dutch*, *Mercury*, Quicksilver is not wanting, but few Artists have made any Experiment of that Mine in this Kingdome.

*Luna*

*The Epistle.*

*Luna*, Silver doth abound in *Great Britain*, especially a very Rich Vein, Rake, or Fibrey thereof was wrought at *Binny-hills* near *Lithgo* in *Scotland*, in the Authors dayes, some part of which he hath, is malleable Silver in the Oare or Mine, yet neglected. And so are many of our richest Mines in *England* and *Wales*, &c. the cause is conceived to be the want of a general and joynt-stock for the imploying our idle people in getting, and working of the Copper, and Silver Mines.

Of the Planet *Sol*, Gold : I may not be silent, whose Golden, Glorious, Pure, Sulphurious, Percing, Spirit, communicating his virtue Mineral unto all things in the Mineral Kingdom, as well as to the Animal and Vegetable Kingdom, whose pure influence producing Gold, caused the poor indigent people of *Scotland*, which the Author did see, *Anno 37*, at *Shortlough*, six men to dig and carry with wheele-barrows, the common Earth or Mould unto Rivolets remote, out of which those men did wash Gold-grains,

as

*The Epistle.*

as good as in the sand of the Rivers, in which Rivers many have gotten Gold, and seen Grains of *Sol*, near one ounce weight, both in the *Low-lands*, and in the *High-lands*; also he hath seen Gold gotten in *England*, but not so plentiful as in *Scotland*: For Sir *James Hope*, An. 1654, brought from *Scotland*, Baggs of Gold Grains unto *Cromwell*, some of which Grains were very large, and as fine as any Gold in the world, that is in Mines; thus I came to see the Baggs, taking a view of the *Low-lands*, and *High-lands* of *Scotland*, Anno 37, in which year, I spent the whole Summer (in opening of Mines, and making of discoveries) was at Sir *James Hopes* Lead Hills, near which I got Gold, and he coming to *London*, imployed Captain *David Acheson*, a Refiner, whom I met with in *Scotland*, Anno 37, to find me out; when I came unto Sir *James Hope*, dwelling in *White Hall*, he produced the Baggs unto me, and poured the Gold out upon a board, in which was one large piece of Gold, which had to it ad-  
joyning

*The Epistle.*

joyning a large piece of white spar very transparent, which Cap. *David Acheson* yet living at *Edenburgh* saw ; but I would never Act with Sir *James Hope*, hoping of these times to see good things acted, for I believe God is about to reveal many of his secrets, unto his Israel in this latter Age, which made me not to Answer the Letter of *Sir James Hope*, as followeth.

Edinburgh 26. June 1654.

Sir, *If I had found the opportunity before my parting, I purposed to have been a sutor to you, and I perswade myself, you are so kinde and generously disposed, that you would have answered my desire, and therefore also even at this distance adventure to offer it : And it is that you would confer upon me one breviate of your journey through the North of Scotland ; as to the discovery of Minerals upon some account, and at first view, this may seem as unreasonable of me desired, as improbable that you should grant it, but the circumstance of time and persons and substance of the things considered, I am not altogether out of hope of it ; onely, I shall say, if you condescend to me in*  
this

*The Epistle.*

*this, though it be more in satisfaction, to my curiosity, then for any designe I have upon the matter ; yet you shall singularly oblige me to indeavour and be ready as opportunity shall offer, to expresse my thankfulness, in what way you will prescribe, that is in the power of ;*

your very affectionate brother

and Servant, *James Hope.*

*This Sir James Hope, was a Judge at the City of Edinburgh, and by Cromwel made Lord Marshall of Scotland.*

My hope now is, that the Honourable and ingenious Corporation of the Mines Royall, will set the Mines at work, that my Inventions, in which I have spent much time and charge, in melting, smelting, extracting, refining and reducing of Mines and Mettals with Pitcoal, Sea-coal and Peats ; and have made with the same Fuell many hundred Tuns of good Merchantable Iron, into cast works and Bars ; may by the inventioner be enjoyed according to the Act of Parliament, 21. *Jacob.* Seeing the Authour can make it appear

*The Epistle.*

appear he hath been much obstructed by lawsuits and the Wars hitherto: Desires that his Talent of Undoubted truths (may not be buried) for the general good, but be brought to light, after all the sad Sufferings of the Authour, whereby he may add unto his new Inventions, what he conceives fit to be done: That not onely this so exhausted Kingdome may enjoy the benefit thereof, but also *Scotland* and *Wales* which abound with Coals, Iron, Stone and Mines of all sorts, minerals and precious Stones, &c.

Yet from *England's* Granery, *Scotland* making no Iron, and other Territories, have their thorow supply, not onely of Iron, but of Iron manufactories many, so hath *Wales*; yet might *Scotland* and *Wales* not onely supply themselves, but supply His Sacred Majesties other Territories with Iron and Iron Wares and Steel also, by Iron and Steel made with Pit-coale, Sea-coale and Peat; and thereby be helpfull unto themselves and *England*, and all Plantations of his Majesties, on this side and beyond the line. To

To the Reader, especially of *England*,  
*Scotland and Wales.*

✓ **T** *He injury and prejudice done unto me &*  
✓ *to this Island, my native Country for the*  
*making of Iron, in cast works and bars with*  
*Pitcoal, Seacoal, Peat and Turff, and with the*  
*like feuell, to melt, extract, refine and reduce*  
*all Mines and mettals, moved me in the neg-*  
*ligence of better Wits and Pens to apologise for*  
*it; in this ensuing Treatise, and believe me*  
*Reader, twas no private, or politick designe in*  
✓ *my Invention, but meer zeal, becomming an*  
*honest man, Patriæ, parentibus and amicis;*  
*that Engaged me (after many others failed) in*  
*these Inventions, for the general good and*  
*preservation of Wood and Timber, which,*

*Eque pauperibus, locupletibus eque,*  
*Eque neglectis pueris senibusq; nocébit;*

*Therefore it concerns His Sacred Majesty, his*  
*high Court of Parliament, all his Counsels,*  
*Mariners, Merchants, Royall and Loyall Sub-*  
*jects (the destruction of Wood and Timber) to*  
*lay it to heart, and helping hands, upon fit oc-*  
*casions, in these so laudable Inventions of*  
*making Iron & melting of mines and refyning*  
*of*

*The Epistle.*

*of them with Pitcole, Seacole, Peat and Turf; for the preservation of Wood and Timber for maintenance of Navigation, men of War, the Fishing and Merchants' Trade, which is the greatest strength of Great Brittain, and all other his Majesties Kingdomes and Territories, whose defence and offence next under God, consists by his sacred Majesties assisting care, and view of his men of War, Ships, experienced marrinours, merchants, Ordinance of Copper, Bras and Iron Armories, Steels and Irons of all sorts; both of bars, squares, and cast works and which ought and may be suplyed from Scotland and Wales by Iron, Copper and Brasse, and made there, with Pitcole, Seacole and Peat; and which abound there and in England, also, In Cornwall, Devonshire, Sommerset, Gloucester, Stafford, Darby, York, Lancaster, Westmerland, Cumberland; are many Copper mines: so is there in Pembroke, Carmarthin, Merionith and Denbyshires, also there are very many rich Coper mines in very many places in Scotland, at Sterling, at Dumfad and many other places well known unto the Authour,*

Dud Dudley.





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## Dud Dudley's *Mettallum Martis.*

❀❀❀ *That Great Britain* with her Men  
 ❀❀❀ of Warr, Fleets and Shiping,  
 ❀❀❀ have had in all Ages, and in  
 ✓ these latter Ages, as great Success at  
 Seas as any people whatsoever in the  
 Universe, cannot modestly be denied  
 in 88, overthrowing that Invincible Ar-  
 mado so long a preparing, and since other  
 Navies also; and whose Armadoes, Na-  
 vies, Armes, and Men, have been a Ter-  
 rour to other Nations; nay her own  
 Grand Magazins, are the very Granary  
 from whence all His Sacred Majesties  
 Kingdomes, Dominions, and Territories  
 both in the *East* and *West-Indies*, on this  
 side and beyond the Line, they have  
 their whole and thorow supply of Shiping,  
 Men,

Men, Armes, Food and Rayment, and  
 ✓ more then can be, from any Kingdom  
 of the Christian World.

Now if Wood and Timber should decay still, and fail, the greatest Strength of *Great Brittain*, her Ships, Mariners, Merchants, Fishings, and His Majesties Navies, and Men of War, for our Defence, and Offence would fail us, which before, and since 88 made his Sacred Majestyes Prodecessors, Queen *Elizabeth*, and her Great Council, the then Parliament, to make Lawes for the preservation of *Wood* and *Timber*, especially near any Navigable River; 1 *Eliz.* 15. 27 *Eliz.* 19. 28 *Eliz.* 3. 5. 23 *Eliz.* 5. All which Laws, and others, for the Preservation of Wood and Timber are still in force, but not duly Executed; also King *James* His Sacred Majestyes Grand-father, and *Prince Henry* for the Preservation of Wood and Timber in this Island, did in the 9<sup>th</sup> Year of His Reign, Grant His Letters Pattents of Priviledge unto *Simon Sturtevant*, Esq.; for 31 years, for the making of Iron with  
 Pit-

Pit-cole and Sea-cole for the preservation of Wood and Timber of *Great Brittain* so greatly then consumed by Ironworks; This Invention was by King *James's* command to be at large put in Print, which Book did contain near a quire of paper in quarto, called, *Simon Sturtevant His Metallica. Anno. 1612. May 22. Printed by George Eld, Cum Privilegio.*

After *Simon Sturtevant* could not perform his making of Iron with Pit-cole or Sea-cole, according unto his Engagement, King *Iames*, and Prince *Henry*, caused him to render up his Pattent, and a new Pattent was Granted unto *Iohn Rovenson*, Esq. who also was Enjoyned to write a Book of his Inventions, called, *Rovenson's Mettallica. Printed for Thomas Thorp, Cum Privilegio: May 15. An. 1613.*

After *Iohn Rovenson*, Esq. had often failed with his Inventions, and great undertakings, *Gombleton*, Esq. a Servant of Queen *Ann's*, undertook (by Pattent) to perform the Invention of making of Iron with Pit-cole, and Sea-cole; but

but he being as confident of his Invention as others, did Erect his works at *Lambeth*, which the Author view'd; and *Gumbleton* failing, the Learned and Ingenious Doctor *Iorden* of *Baths*, the Authors Acquaintance, and sundry others obtained Pattents for the making of Iron, and melting of Mines with Pit-cole and Sea-cole, for the preservation of Wood and Timber all which Inventions and endeavours to Effect and Perfect the said Works, have been by many heretofore well known, to have worthily attempted the said Invention, though with fruitless success.

Having seen many of their failings, I held it my Duty to endeavour, if it were possible to Effect and Perfect so laudable, and beneficial, and also so much desired Inventions, as the making of Iron into cast Works and Bars; and also the Melting, Extracting, Refining and Reducing all sorts of Mines, Minerals and Metals, with Pit-cole, Sea-cole, Peat, and Turf, for the preservation of wood and timber,

so much exhausted by Iron Works of late.

Having former knowledge and delight in Iron Works of my Fathers, when I was but a Youth; afterward at 20 years Old, was I fetched from *Oxford*, then of *Bayliol* Colledge, *Anno* 1619, to look and manage 3 Iron Works of my Fathers, 1 Furnace, and 2 Forges, in the Chase of *Pensnet*, in *Worcester-shire*, but Wood and Charcole, growing then scant, and Pit-coles, in great quantities abounding near the Furnace, did induce me to alter my Furnace, and to attempt by my new Invention, the making of Iron with Pit-cole, assuring my self in my Invention, the loss to me could not be greater then others, nor so great, although my success should prove fruitless; But I found such success at first tryal animated me, for at my tryal or blast, I made Iron to profit with Pit-cole, and found *Facere est addere Inventioni*.

After I had made a second blast and tryal, the fesibility of making Iron with  
Pit-

Pit-cole and Sea-cole, I found by my new Invention, the quality to be good and profitable, but the quantity did not exceed above 3 Tuns *per* week: After I had brought my Invention unto some perfection, and profitable, doubted not in the future to have advanced my Invention, to make quantity also.

Immediately after my second tryal, I wrote unto my Father what I had done, and withall, desired him to obtain a Patent for it from King *James* of Blessed Memory; the Answer to which Letter I shall insert, only to shew the forwardness of King *James*, in this his much animating the Inventor, as he did both *Simon Sturtevant*, *Iohn Rovenson*, Doctor *Iordanie* and others; The Letter follows;

Son *Dudley*,

*The Kings Majesty being at New-Market, I sent Parkes thither on Saturday to some Friends of mine, to move the Kings Majesty for my Pattent, which be coming on Sunday Morning, in the Afternoon His Majesty sent a Warrant*

*Warrant to Master Attorney to dispatch my Pattent, for the which I am infinitely bound unto His Majesty, that it pleased Him of His Great Grace and Favour to dispatch it so soon ; I have been this night with Master Attorney, who will make hast for me ; God Bless you, and Commend me unto all my Friends :*

March 10.  
1619.

Your Loving Father,  
*Edward Dudley.*

This *Richard Parkes*, a Parks-house Esq ; in the Letter before mentioned, was the Authors Brother in Law, which did about 1 year after the *Pattent* was granted, carry for the Author much good Merchantable Iron unto the *Tower*, by King *James's* command to be tryed by all Artists, and they did very well approve of the Iron, and the said *Parkshouse* had a fowling Gun there made of Pit-cole Iron, with his name gilt upon the Gun, which Gun was taken from him by Colonel *Levison* Governour of *Dudley* Castle, and never restored.

The



The said *Richard Parkshouse's* son my Nephew, *Edward Parkshouse*, the 5th. of *Januaay* 1664. pressed me much to put Pen unto Paper, to shew what I have done in the invention of making of Iron with Pitcoale and Seacoal, not unknown unto this Country, and to my brother *Folliott*, Esq; and my Nephew *Parkshouse* Esq; and to my Kinsman Master *Francis Dingley*, to whom I intend to leave the Secrets of my Inventions, notwithstanding all my sad sufferings from time to time this forty Years in the invention, my Sufferings in the War, and my Estate sold for my Loyalty; and also my sad sufferings and obstructions since his Sacred Majesties happy Restauration many wayes; and also upon sundry and many references, at the Authors very great charge, pains, and time spent of Foure years in his aged dayes, for the general good, by his inventions for the preservation of Great *Brittain's* Wood and Timber.

Now let me shew some Reasons that induced me to undertake these Inventions,  
after

after the many failings of others, well knowing that withing Ten miles of *Dudley* Castle there to be neer 20000. Smiths of all sorts, and many Iron works at that time, within that Circle decayed for want of Wood (yet formerly a mighty Woodland Country.)

Secondly, The Lord *Dudley's* Woods and Works decayed, but Pitcoal and Iron, Stone or Mines abounding, upon his Lands, but of little Use.

Thirdly, Because most of the Coale Mines in these parts, as well as upon the Lord *Dudley's* lands, are Coals, Ten, Eleven, and Twelve yards thick; the top or the uppermost Cole, or vein, gotten upon the superficies of this Globe or Earth, in open works.

Fourthly, Under this great thickness of Coal, is very many sorts of Iron, Stone, Mines, in the Earth Clay or Stone earth, like bats in all four yards thick; also under these Iron mines is severall yards thick of Coals, but of these in an other place more convenient.

Fifthly,

Fifthly, Knowing that when the Colliers are forced to sinck Pits for getting of ten yards thick of Cole one third Part of the Coles or more, that be gotten under the ground, being small are of little or of no use in that inland Country nor is it worth the drawing out of the Pits, unlesse it might be made use of by making of Iron therewith into cast works or Bars.

Sixthly, Then knowing that if there could be any use made of the smal-coale that are of little Use, then would they be drawn out of the Pits, which coles produceth often times great prejudice unto the Owners of the works and the work it self, and also unto the Colliers, who casting of the smalcoles together, which compelling necessity enforcing the Colliers so to do, for two causes; one is to raise them to cut down the ten yards thicknesse of coles drawing onely the bigger sort of cole, not regarding the lesser or small cole, which will bring no money; saying, *He that liveth longest let him*

*him fetch fire further:* Next, These Colliers must cast these coles, and sleek or drosse out of their wayes, which sulphurious small cole and crouded moyst sleek heat naturally, and kindles in the middle of those great heaps; often fals the cole-works on Fire, and flaming out of the Pits, and continue burning like *Ætna* in *Cicity*, or *Hecla* in the *Indies*.

Yet when these loose Sulphurious compost of cole and sleek, being consumed in processe of time, the Fire decays, yet notwithstanding the Fire hath continued in some Pits many years; yet colliers have gotten coles again, in those same Pits, the Fire not penetrating the solid and firme wall of coles, because *Pabulum ignis est Aer*, the Ayre could not penetrate, but passe by it in the loose cole and sleek; for comming into those pits afterwards, I have beheld the very blows of Pikes or tools that got the coles there formerly. Also from these Sulphurious heaps, mixed with Iron, Stone (for out of many of the same pits is gotten much  
Iron,

Iron, Stone, Mines; the Fires heating vast quanties of Water, passing thorow these Soughs or Adits, becometh as hot as the Bath at *Bathe*, and more healing and sovereign even for old Ulcers and Sores; because many of these Baths doe proceed not onely from common Sulphur and vitriol of *Mars*, but also from *Solar* sulphur in this Iron stone; I hope, *Filii Artis*, will excuse my digesion from the making of Iron with Pitcole, Seacole, Peat or Turff, and the melting of mines and mettals and refining of the same, with the like fuell: the first Pattent being granted by King *James* for 31, Years in the 19th year of his Reign upon just and true information, that the Authour had the year before made many Tuns of Iron with Pitcole at a Furnace or Iron-work, in the Chase of *Pensnet*, in the County of *Worcester*, besides cast Iron Works of sundry sorts with Pitcoles; and also at two Forges or Iron Mills, called, *Cradly Forges*, fined the said Iron into Merchantable good Bar  
Iron :

Iron; But the year following, the grant or Patten for making of Iron with Pit-cole or Seacole, There was so great a Flood, by rain, to this day, called the great *May-day-Flood*, that it not onely ruinated the Authours Iron works, and inventions; but also many other mens Iron works: and at a market Town called *Sturbridge* in *Committate Wigornia*, although the Authour sent with speed to preserve the people from drowning; one resolute man was carried from the Bridge there in the day time, and the nether part of the Town was so deep in Water that the people had much ado to preserve their lives in the uppermost rooms in their Houses.

My Yron works and inventions thus demolished, to the joy of many Iron masters, whose works scaped the Flood and who had often disparaged the Authours Inventions, because the Authour sold good Iron cheaper then they could afford it; and which induced many of the Iron masters to complain unto King *Iames*,  
averring,

overring that the iron was not Merchant-  
 able; As soon as the Author had repair-  
 ed his works and inventions (to his no  
 small charge) they so far prevailed with  
 King *James*, that the Authour was com-  
 manded with all speed possible, to send all  
 sorts of Bar iron up to the Tower of *Lon-*  
*don*, fit for making of Musquets, Car-  
 bines and Iron for great Bolts, fit for  
 Shipping, which Iron being so tried by  
 Artists and Smiths, that the iron masters  
 and Iron-mongers were all silenced until  
 21th of King *James*: At the then Parlia-  
 ment, all *Monopolies* were made *Null*,  
 and diverse of the Iron-masters endea-  
 vouring to bring the invention of ma-  
 king Iron with Pitcole, Seacole, Peat and  
 Turff, within the compasse of a *Monopoly*;  
 but the Lord *Dudley* and the Authour did  
 prevaile; yet the Pattennt was limited  
 to continue but Fourteen years; after  
 which Act the Authour went on with his  
 invention cheerfully, and made annually  
 great store of Iron, good and merchant-  
 able, and sold it unto diverse men yet  
 living

living at Twelve pounds *per* Tun; I also made all sorts of cast iron Wares, as Brewing-Cysterns, Pots, Morters, and better and cheaper than any yet were made in these Nations, with *Charcoles*; Some of which are extant to be seen by any man (at the Authours House in the City of *Worcester*) that desire to be satisfied of the truth in the Invention.

Afterwards, The Author was outed of his works and inventions before mentioned by the Iron-masters and others wrongfully, over long to relate: yet being unwilling his Inventions (having undergone much charge and pains therein) should fall to the ground, and be buried in him, made him to set forward his Invention again, at a Furnace called, *Himley Furnace* in the County of *Stafford*, where he made much Iron with Pit-cole, but wanting a Forge to make it into bars, was constrained for want of Stock to sell the Pig-Iron unto the Charcole Iron-masters, who did him much prejudice, not onely in detaining his stock, but also  
disparaging



disparaging the Iron ; *Himley* Furnace being Rented out unto Charcole Iron-Masters.

The Authour Erected a new large Furnace on purpose, 27 foot square, all of stone for his new Invention, at a place called, *Hasco Bridge*, in the parish of *Sedgley*, and County of *Stafford* ; the Bellows of which Furnace were larger then ordinary Bellows are, in which work he made 7 Tuns of Iron *per* week, the greatest quantity of Pit-cole-Iron that ever yet was made in *Great Brittain* ; near which Furnace, the Author discovered many new Cole-mines 10 yards thick, and Iron-Mine under it, according to other Cole-works ; which Cole-works being brought unto perfection, the Author was by force thrown out of them, and the Bellows of his new Furnace and Invention, by riotous persons cut in pieces, to his no small prejudice, and loss of his Invention of making of Iron with Pit-cole, Sea-cole, &c. So that being with Law-Suites, and Riots, wearied and disabled

abled to prosecute his Art and Invention at present, even untill the first Pattent was extinct: Notwithstanding the Author his sad Sufferings, Imprisonments wrongfully for several thousand pound in the *Counter* in *London*, yet did obtaine a new Pattent, dated the 2<sup>d</sup> of *May*, Anno 14. *Caroli Primi* of ever Blessed Memory, not only for the making of Iron into cast-works, and bars, but also for the Melting, Extracting, Refining and Reducing of all Mines, Minerals and Mettals, with Pit-cole, Sea-cole, Peat, and Turf, for the preservation of Wood and Timber of this Island; into which Pattent, the Author, for the better support and management of his Invention, so much opposed formerly at the Court, at the Parliament, and at the Law, took in *David Ramsey*, Esquire, Resident at the Court; Sir *George Horsey*, at the Parliament; *Roger Foulke*, Esquire, a Counsellour of the *Temple*, and an Ingenious Man; and also an Iron Master, my Neighbour, and one who did well know my former Sufferings, and  
what

what I had done in the Invention of making of Iron with Pit-cole, &c.

All which said Patentees, Articled the 11<sup>th</sup> of *June* following, the Grant not only to pay the Authour all the charges of passing the Pattent laid down by him, but also to lay in for a common and joynt-stock each man of the four, one hundred pounds, and so from time to time, what more stock any three of the Pattentees should think fit to be laid in for the making of Iron into cast works and bars, and likewise for the Melting, Extracting, Refining and Reducing of all Mines, Minerals, and Metals, with Pit-cole, Sea-cole, Peat and Turf, which Articles are yet extant.

Now let me without offence insert the opposition we all had, by means of powerfull Iron-Masters, with Sir *Philibeard Vernat*, a *Dutch* Man, and Captain *Whitmore*, who pretended much unto his late Sacred Majesty, but performed not their undertaking, which caused the Author, and his Partners thus to Petition.

*To*

*To the King's Most Excellent Majesty:*

**The Humble Petition of Sir *George Horsey*  
Knight; *David Ramsey*, *Roger Foulke*,  
and *Dud Dudley*, Esquires :**

Humbly Sheweth,

*That whereas Your Petitioners being called before the Right Honourable, the Lord Keeper by Your Majesties Appointment, touching the making of Iron with Pil-cole, Sea-cole, Peat and Turf, for which they have Your Majesties Pattent; and seeing that Sir Philibeard Vernat, and Captain Whitmore, who are not Inventors, have obtained a Pattent also for the same; yet before their Pattent Granted, Sir Philibeard was ordered at Council-board, according to his Great Undertaking, to perfect his Great Undertaking and Invention within Two Years, and there hath been near Three Years passed, and yet have made little or no Iron: still he Opposeth Your Petitioners, and doth neither benefit himself, but hinders Your Majesty, and the Kingdom.*

The

The reference unto the Petition followeth; At the Court at *Greenwich*, May 20, 1638. His Majesty is pleased to refer this Petition to Master Attorney, and Master Solicitor General, to call the Petitioners before them, and to compose the differences between them; (if they can) or otherwise, to certify his Majesty their opinions therein :

*Sir Sidney Mountegue was then  
Master of the Requests.*

But Sir *Philibeard Vernat*, and Captain *Whitmore* never appeared any more for their Invention.

Not long after the Wars came on, and caused my partners to desist, since which they are all dead, but the Author, and his Estate (for his Loyalty unto his late Sacred Majesty) and Master, (as by the Additional Act of Parliament may appear) was totally sold.

Yet nevertheless, I still endeavoured not to bury my Talient, took in two  
Partners

Partners into my inventions, *Walter Stevens* of *Bristow* Linnen Draper, and *John Ston* of the same City Merchant, after the Authour had begun to Erect a new work for the Inventions aforesaid, near *Bristow*, Anno 51, and there we three Partners had in stock near 700l. but they not only cunningly drew me into Bond, entered upon my Stock and Work, unto this day detained it, but also did unjustly enter Staple Actions in *Bristow* of great value against me, because I was of the Kings Party ; unto the great prejudice of my Inventions and Proceedings, my Patent being then almost extinct : for which, and my Stock, am I forced to Sue them in Chancery.

In the interim of my proceedings, *Cromwell*, and the then Parliament, granted a Pattent, and an Act of Parliament unto Captain *Buck* of *Hampton Road*, for the making of Iron with Pit-cole and Sea-cole ; *Cromwell*, and many of his Officers were Partners, as Major *Wildman* and others ; many Doctors of Physick, and  
 Merchants,

Merchants, who set up diverse and sundry Works, and Furnaces at a vast charge, in the Forrest of *Dean*, and after they had spent much in their Invention and Experiments, which was done in spacious Wind-Furnaces, and also in Potts of Glass-house Clay; and failing afterwards, got unto them an Ingenious Glass-Maker, Master *Edward Dagney* an *Italian* then living in *Bristow*, who after he had made many Potts, for that purpose went with them into the Forrest of *Dean*, and built for the said Captain *Buck* and his Partners, a new Furnace, and made therein many and sundry Experiments and Tryals for the making of Iron with Pit-cole and Sea-cole, &c. But he failing, and his Potts being all broken, he did return to *Bristow* frustrate of his Expectation; but further promising to come again, and make more Experiments; at which time Master *John Williams*, Master *Dagneys*, Master of the Glass-House was then drawn in to be a Partner for 300*l.* deposited, and most of it

it spent, the said *Williams* and *Dagney* hearing that the Authour had knowledge in the making of Iron with Pit-cole, Sea-cole, &c. they from Cap. Buck, and the other Partners importuned the Author, who was at that time in great danger by the Parliament, (being a Colonel of the Kings Party) to go along with them into the Forrest of *Dean*, which at that time durst not deny; Coming thither, I observed their manner of working, and found it impossible, that the said *Edward Dagney* by his Invention should make any Iron with Pit-cole or Sea-cole, in Pots to profit: I continued with them till all their Potts and Inventions failed; at every Dinner and Supper, Captain *Buck*, Captain *Robins*, Doctor *Ivie*, Doctor *Fowler* and others, would aske the Author why he was so confident that Iron in quantity could not be made by their new Inventions? I found it a difficult thing to dissuade the Partners from their way, so confident were they to perform the making of iron with Pit-cole or Sea-cole to profit;



profit; that they desired me to come again a second time into the Forrest to see it Effected; But at that time, I saw their failings also.

Yet nevertheless Captain *Buck*, and his Partners Erected new Works at the City of *Bristow*, in which they did fail as much as in their former Inventions; but Major *Wildman*, more barbarous to me then a Wildman, (although a Minister bought the Authors Estate, near 200*l. per Annum*, intending to compell from the Author his Inventions of making of Iron with Pit-cole; but afterwards passed my Estate unto two Barbarous Brokers of *London*, that pulled down the Authors two Mantion Houses; sold 500 Timber Trees off his Land, and to this day are his Houses unrepaired.

*Anno* 1655. Captain *Buck* and his Partners wearied of their Invention, desisting, *An.* 1656. Captain *John Copley* from *Cromwell* obtained another Pattent for the making of Iron with Pit-cole and Sea-cole; He and his Partners set up their  
Works,

Works, at the Cole-Works near *Bristow*, and endeavour'd by Engineers assistance to get his Bellows to be blown, at, or near the Pits of Cole, with which Engines the Work could not be performed : But the Author coming to see the said Works, and after many Discourses with Captain *Copley*, his former Acquaintance, told him plainly, if his Bellows could have been blown by those Engines, yet I feared he could not make Iron with Pit-cole or Sea-cole ; he seemed discontented ; whereupon, and without those Engines I made his Bellows to be blown feisibly, as by the Note under his hand appears (the first Note) followeth ;

1656. *December 30.*

Memorandum, *The day and year abovewritten, I John Copley of London, Gent. Do acknowledge, that after the Expence of diverse Hundred Pounds to Engineers, for the making of my Bellows to blow, for the making of Iron with Pit-cole or Sea-cole near Bristow, and near the Forrest of Kingswood ;*  
*That*

*that Dud Dudley Esq. did perform the blowing of the said Bellows at the Works or Pits abovesaid ; a very feisible and plausible way, that one man may blow them with pleasure the space of an hour or two ; and this I do acknowledge to be performed with a very small charge, and without any money paid to him for the same Invention :*

John Copley.

Captain *John Copley* thus failing in his Inventions, *An.* 1657, he went into *Ireland*, and all men now desisting from the Inventions of making of Iron with Pit-cole and Sea-cole : The Author, *Anno* 1660. being 61. years of Age, and moved with pitty, and seeing no man able to perform the Mastery of making of Iron with Pit-cole or Sea-cole, immediately upon his Sacred Majesties happy Restauration, the same day he Landed, Petitioned that he might be<sup>t</sup> restored to his place, and his Pattent obstructed, revived for the making of Iron with Pit-cole, Sea-cole, Peat and Turf, into cast  
Works

Works and Bars, and for the Melting, Extracting, Refining and Reducing of all Mines, Mettals and Minerals, with Pit-cole, Sea-cole, Peat and Turf; which said Laudable Invention, the Author was and is unwilling should fall to the ground and dye with him, neither is the Mistery, or Mastery of the Invention Effected and Perfected by any man known unto the Authour, as yet, either in *England*, *Scotland* or *Wales*; all which three abound with Pit-cole or Sea-cole, and do overmuch furnish other Kingdomes many with Pit-cole and Sea-cole, when they might make far better use of it themselves, especially *Scotland* and *Wales*, both for the making of Iron into cast Works and Bars; and also for the making of Steel, and Melting, Extracting, and Refining of Lead, Tin, Iron, Gold, Copper, Quicksilver, and Silver, with Pit-cole, and Sea-cole.

I shall not trouble you with the Petition, or my reasons and desires that were annexed unto it, for the making of Iron,  
and

and Melting of Mines, &c. with Pit-cole, &c. they are over long to relate, only the Reference to them is thus; (after my first Petition was lost, I Petitioned again.)

*At the Court at Whiteh. 22. of June 1663.*

His Majesty is graciously pleased to refer the consideration of this Petition to Master Attorney, and Solicitor General, or to either of them, together with the Petitioners Reasons and Desires hereunto annexed; and they, or either of them, are to inform, and certifie His Majesty, what they, or either of them in their Judgements respectively conceive fit for His Majesty to do concerning the Petitioners Humble Request, and then His Majesty will declare his further pleasure.

Robert Mason, *Master of Requests.*

After Master Attorney, and Sollicitor General would do nothing upon the Reference;

ference; the Author Petitioned His Sacred Majesty sitting at the Council-Board, for the Renewing of his Pattent, for making of Iron, and Melting, of Mines with Pit-cole, Sea-cole, often obstructed; the reference to that Petition followeth.

*At the Court at Whitehall, Ju/y 25. 1660.*

Upon reading of a Petition this day at the Board, being the same in terminis with this above-written, which His Majesty was graciously pleased by a Reference under the hand of Doctor *Mason*, one of the Masters of the Requests, to refer to the consideration of Master Attorney, and Master Solicitor General, together with the Petitioners Reasons and Desires thereunto annexed, to the Consideration of the Lords, and others Commissioners for the Treasury, who upon Examination of the particulars, are to give such order thereupon, as they shall find most proper for His Majesties Service.

*Sir Edward Walker was*

*Clark to the Council, and*

*Garter King at Armes.*

The Author, during the Lords Commissioners their time, could get no Order upon his Reference ; But his Petition was left, with the now Right Honourable, the Lord Treasurer, to take or grant further order therein, but the Author hath gotten hitherto no order.

Therefore compelling necessity doth constrain (having prosecuted his Petition hitherto) him to desist from his Inventions, in which he hath taken more pains, care and charge, then any man, to perfect his new Invention in these Kingdomes.

Although the Author hath not as yet so fully perfected or raised his invention, to the quantity of Charcole Iron Furnaces, yet the Authors quantity being but seven Tuns *per* week at the most, together with the quality of his Iron made with Pit-cole and Sea-cole, hath the most eminent Triplicity of Iron of all that can be desired in any new Invention.

I. More Sufficient. 2. More Cheap.  
3. More Excellent.

Upon

Upon which triplicity, the Authour might enlarge himself, but shall not be tedious, only give me leave to mention that there be three sorts of Cast Iron;

1. The first sort is Gray Iron.

2. The second sort is called Motley Iron, of which one part of the Soves or Piggs is gray, the other part is white intermixt.

3. The third sort is called white Iron, this is almost as white as Bell-Mettle, but in the Furnace is least fined, and the most Terrestrial; of the three, the Motley Iron is somewhat more fined, but the Gray Iron, is most fined, and more sufficient to make Bar-Iron with, and tough Iron to make Ordnance, or any Cast Vessels, being it is more fined in the Furnace, and more malliable and tough, then the other two sorts before mentioned; and of this sort, is the Iron made with Pit-cole, Sea-cole for the most part, and therefore more sufficiently to be preferred.

More



2. More cheaper Iron there cannot be made, for the Author did sell pigg or cast Iron made with Pit-cole at four pounds *per* Tun, many Tuns in the twentieth year of King *James*, with good profit; of late, Charcole Pig-iron hath been sold at six pounds *per* Tun, yea at seven pounds *per* Tun hath much been sold.

Also the Author did sell Bar-iron Good and Merchantable, at twelve pounds *per* Tun, and under, but since Bar-iron hath been sold for the most part ever since at 15*l.* 16*l.* 17*l.* and 18*l.* *per* Tun, by Charcole Iron-Masters.

3. More Excellent for diverse Reasons, and principally, being the meanes whereby the Wood and Timber of this Island almost exhausted, may be timely preserved yet; and vegetate and grow again unto his former wonted cheapness, for the maintenance of Navigation, which is the greatest Strength of *Great Brittain*, whose Defence and Offence for all the Territories that belong unto it, next  
under

under God and his Vice-Gerent, our Sacred Majesties Cares, consists most of Shiping, Men of War, Experienced Mariners, Ordnances, Ammunition, and Stores, the Ordnance made therewith will be more gray and tough, therefore more serviceable at Sea and Land, and the Bar-iron will wall, rivet, and hold better then most commonly Charcole Iron.

2. More Excellent, not onely in respect the Invention of making of Iron with Pit-cole and Sea-cole will preserve Wood and Timber of *Great Brittain* so greatly consumed by Iron-Works of late.

But also in respect, this my Invention will preserve many Millions of Tuns of Small-cole in *Great Brittain*, which will be lost in time to come, as formerly they were, for within ten miles of *Dudley Castle*, is annually consumed four or five thousand Tuns at least of small Pit-cole, and have been so consumed time out of  
mind

mind under ground, fit to have it made Pit-iron with; which coles are and (unless Iron be made therewith) will be for ever totally and annually lost; if four or five thousand Tun of Cole be consumed within ten miles compass, what Coles is thus consumed in all *England, Scotland, and Wales*? which is no good Husbandry for *Great Brittain*, *hinc ille lacrimæ*, that our Timber is exhausted.

Must I be still opposed, and never enjoy my Inventions, nor *Great Brittain* the Benefit?

Must my Pattent be obstructed in Peace, as it was extinct by the Wars?

And must not my Pattent be Revived for the making of Iron with Pit-cole, Sea-cole, Peat, and Turf, but find Enemies still to oppose it?

How many thousand Tuns of Iron might have been made but since my first Invention, *An. Jacob. 18th* by my means with Pit-cole, and Sea-cole (lost) if I had not had Enemies; and had not wood and timber been preserved? But

But most men will aver, that it doth concern the Author to Demonstrate the great losse mentioned formerly of Pit-cole annually ; .

*It is thus,*

There is at least within ten miles of the Castle of *Dudley*, twelve or fourteen Cole-Works, some in *Worcester*, and some of them in *Stafford-shire* (now in work, and twice as many in that Circute not in work) each of which Works get two thousand Tun of Cole yearly, some get three, four or five thousand Tun of Coles yearly : and the uppermost or top measures of Coles are ten, eleven, and some twelve yards thick ; the Coles Ascending, Basseting, or as the Colliers term it, Cropping up even unto the superficies of the Earth, and there the Colliers formerly got the Coles ; but where the Coles is deep and but little Earth upon the measures of Coles, there the Colliers rid off the Earth, and dig the Coles under their feet ; these Works are called Foot-rids. But

But of these Works there are now but few, some of these small Coles in these open Works, the poor people did carry away, but paid nothing for them in former times, termed the Brain Carriages.

But now the Colliers working more in the deep of these Works, they are constrained to sink Pits, some of which Pits are from eight unto twenty yards deep, and some are near twenty fathome deep, which fathome contains two yards.

In these Pits, after you have made or hit the uppermost measures of Cole, and sink or digged thorow them, the Colliers getting the nethermost part of the Coles first, about two yards in height or more, and when they have wrought the Crutes or Staules, (as some Colliers call them) as broad and as far in under the ground, as they think fit, they throw the small Coles (fit to make Iron) out of their way on heaps to raise them up so high, to stand upon, that they may, with the working of their Picks or Maundrills over  
their

their heads, and at the one end of the Coles so far in as their Tool will permit, and so high as their working cometh unto a parting in the measure of Cole, the which Coles, to the parting by his self clogging and pondrous weight, fall often many Tuns of coles, many yards high down at once; with which fall and the Colliers breaking of the said Cole, many small coles do so abound of no use, and fit for no sale; that in getting of twenty thousand Tun of Pit-cole, one half near is small cole, not drawn out of the Pits, but destroyed, left, and lost; which small cole, with the sleek thrown moyst together, (heat the sooner) and by means of its sulphurousness fire in the Pits, to no small prejudice unto the Owners of the Works, and the Workmen, besides *Great Brittain's* Loss; which Cole might have made many thousand Tuns of Iron, and also have preserved this Islands Woods and Timber: I might here give you the names, and partly the nature

nature of every measure, or parting of each cole lying upon each other; the three uppermost measures are called the white measures for his white Arcenical, Salsuginos and Sulphurious substance which is in that Cole; the next measure, is the shoulder-cole, the toe-cole, the foot-cole, the yard-cole, the sliper-cole, the sawyer-cole, and the frisly-cole, these last three coles are the best for the making of Iron, yet other coles may be made use of.

I might give you other names of coles, but desire not prolixity, yet must I tell you of a supernumerary number of Smiths within ten miles of these Cole-Works near twenty thousand; yet God of his Infinite goodness (if we will but take notice of his goodness unto this Nation) hath made this Country a very Granary for the supplying these Men with Iron, Cole, and Lime made with cole, which hath much supplied these men with Corn also of late, and from these men, a great part not only of this Island,

Island, but also of his Majesties other Kingdomes and Territories with Iron wares have their supply, and wood in these parts almost exhausted, although it were of late a mighty wood-land Country.

Now if the Coles and Iron-stone so abounding were made right use of, we need not want Iron as we do; for very many measures of iron-stone are placed together under the great ten yards thickness of cole, and upon another thickness of coles two yards thick, not yet mentioned, called the bottom-cole, or the heathen cole, as if God had decreed the time when, and how these Smiths should be supplied, and this Island also with Iron, and most especially, that this cole and iron-stone, should give the first, and just occasion for the invention of the making of iron with pit-cole, no place being so fit for the invention to be perfected in, then this Country, for the general good; whose Woods did formerly abound in  
Forrests,



Forrests, Chases, Parks and Woods, but exhausted in these parts.

Now for the names of the iron-stone, the first measure is called the Black-row-graines, lying in very hard and black Earth.

The second measure is the Dun-row-graines, lying in dun earth or clay.

The third measure is called the white row grains, lying in very white Earth or Clay; under these three measure are sundry other measures, and are called, first, the Rider Stone; secondly, the Cloud Stone; thirdly, the bottom Stone; fourthly, the Cannock or Cannotstone, which last may wel be so caled (although all the other measures be very good) yet this Stone is so Sulphurous and Terrestrial, not fit to make Iron; because the Iron thereof made is very Redshare, which is that if a workman should Draw or Forge out a Share mould fit for a Plough in that red heat, it would crack and not be fit for the Use of the Husband-  
mans

mans Plough or Share. I may take occasion here to speak of the Nature of Coldshare Iron, which is so brittle if made of the grain Oare or Iron stone would be almost as brittle as some *Regulus Antimonii* made Iron, for with one small blow over an Anvil you may break the biggest Bar that is, if it be perfect coldshare Iron; nay the Plough-man often breaks his Share point off if it be made of coldshare Iron. But perfect tough malliable Iron will not break feisibly in hot-heat or cold, as coldshare wil, or red hot as Sulphurious veneriated redshare Iron will; but yet tough enough when it is cold: All which aforesaid qualities of Iron the Authour very well knoweth how to mend their Natures, by finning or setting the finery, lesse transhaw more borrow which are terms of art, and by altering and pitching the works, and plates, the fore spirit-plat, the tuiron, bottome, back and breast or fore-plate, by the altering of which much may be done

done, if the work be set transhaw and transiring from the blast, the Iron is more coldshare lesse Fined, more to the Masters profit; lesse profitable to him that makes it into manufactorage, and lesse profitable to him that useth it; but the Iron made in a Burrow work, becometh more tough and serviceable; yet the nature of all Iron stone, is to be considered, both in the Furnace, and in the finery, that the Sulphurious Arceniall and Veneriating qualities, which are oftentimes in Iron stone be made to separate, in both the works from the fixed and fixing bodies of Iron, whose fiery quality is such, that he will sooner self calfine than separate from any Sulphurious venerated quality.

No man, I hope, need to be offended at any terms of Art, it hath been alwayes lawfull for Authours of new Arts and Inventions, at their own pleasures, to give name to their new Inventions and Arts, every Tradesman is allowed it in his mystery.

But

But the Authour hath as much as he could avoided the terms of Art that *Simon Sturtenante* and others have used, which are very many: onely the Author hath given you the common names and terms (for the most part) which are so common among Forge-men and Founders, as is nothing more common; but kept secret amongst them and a mystery not yet known, but unto very few Owners of Iron-works; nay I have not yet troubled your memory with any of the Founder terms, of but making his harth as the Timpe stones, the Wind-wall stones, the Furion stones, the Botton-stone, the Back-stones and the Boshes, in the making and pitching of which harth, is much of the Mystery.

I must confesse, there is given unto some Phylosophers, *etc filii Artis*, some few terms how the Sulphurious Arsenicall, Bituminos, Antimoniall, Venerial, and other poysonous qualities, either in the Pit-cole, Sea-cole, or the Iron-stone,  
may

may be in part at the Furnace separated, and not permitted to incorporate in the Iron, and if it be incorporated, yet by Fining at the Forge, to fetch it out; also to melt extract, refine, and reduce all mines mettals and minerals, unto their species with Pit-cole, Sea-cole, Peat, and Turff, by wayes not yet in use, which the Author will make known, hereafter, if God permit him health, time and space, or leave his knowledg unto his Brother *Aylmore Folliott*, Esq; his Nephew *Parkhouse*, Esq; and to his Kinsman Master *Francis Dingley*, to declare unto this latter Age of the World, in which God is pleased to manifest many of his Secrets; *Qui vult secreta scire, secreta secrete sciat custodire.*

Having suffered much, ever since the Year 1618. unto this present, for the general good, as by the preceding discourse appears for the making of Iron with Pitcole, Seacole, Peat, and Turff; for the preservation of Wood & Timber of Great *Brittain* so much exhausted, for  
future

future prevention of which,

Is first, to permit the Authour to enjoy His Pattent, and fully to perfect his said Inventions (obstructed in the Reign both of King *James* and in the Reign of his Sacred Majesty King *Charls* the First, of ever Blessed Memory ; and lately since his most Sacred Majesties happy Restauration) who desires nothing but to be animated with the Patent revived according unto the Statute of 21. *Iacob.* for Inventors.

Secondly, to impower the Authour or any other Agents to take care that no Pit-cole, or Seacole be any wayes wilfully destroyed under ground.

Thirdly, To put all former good Laws in Execution, and to make others for the preservation of Wood and Timber of these Nations, especially neer Navigagable River or Seas.

✓ Fourthly, Seeing there goeth out of *England, Scotland* and *Wales*, many thousand Tuns Annually of Pitcole and Seacole

coles to furnish *France*, and also the Smiths thereof *Spaine, Portugal* and *Flanders*, and especially the Smiths thereof; the *Low-Countries* and the Smiths thereof, besides the *Hollanders* carries great quanties of our Coles unto Foreigne parts, without which those Countries cannot subsist: Now the Authors desire is, that where there is a conveniency of Iron stone or Ewre, the Coles may not be transported (paying His Sacred Majesties Duty) untill Order from His Majesty or his Privy Council.

Fifthly, That no Pitcole be Exported, seeing that Wood fuell and Timber is decayed for Buildings, and instead thereof Brickmaking (formerly spending Wood, but now coles) is much in use; also is Glasse now made with cole, but formerly were there many Thousand Loads of Wood fuell spent in the making thereof, and the Glass Invention with Pitcole was first effected near the Authours Dwelling.

Sixthly,

Sixthly, Making of Steel, Brewings, making of Coppras, Allum, Salt, casting of Brasse and Copper, Dyings, and many other Works were not many years since done altogether with the Fuell of Wood and Charcole; instead whereof, Pitcole, and Seacole is now used as Effectually, and to a far better Use and Purpose; besides the preservation of Wood and Timber.

Seventhly, That which is somewhat neerer the mark and Invention; the Blacksmith forged all his Iron with Charcole, and in some places where they are cheap, they continue this course still, but small Pitcole and Seacole, and also Peat and Turff hath and doth serve the turn as well and sufficiently as Charcole.

Eighthly, That which is nearest, and my perfect Invention, and neer the Authours Dwelling, called *Greens-lodge*, there are four Forges, namely, *Greens-forge*, *Swin-forge*, *Heath-forge* and *Cradley-forge*.

Which



Which Four Forges have Barred all or most part of their Iron with Pitcole ever since the Authours first Invention, 1618. which hath preserved much Wood: In these Four, besides many other Forges do the like; yet the Author hath had no benefit thereby to this present.

Yet by this Barring of Iron with Pitcole 30000 loads of Wood and more have been preserved for the general good, which otherwayes must have been had and consumed.

*Symon Sturtevant*, in his *Metallica*, in the Epistle to the Reader, saith, *That there was then Anno 12. Jacobi in England, Scotland, Ireland and Wales 800 Furnaces Forges, or Iron Mills making Iron with Charcole*: Now we may suppose at least 300 of these to be Furnaces, and 500 to be Forges; and each Furnace making fifteen Tun *per* week of Pig or cast Iron, and work or blow but Forty week *per Annum*, but some Furnaces make Twenty  
Tuns

Tuns of Pig Iron *per* Week, and two Loads of Charcole or there about, go to the making of a Tun of Pig Iron: And two Loads (or two cords) of Wood, at the least, go to the making of a load of Charcole.

Now what Loads of Wood or Charcole is spent in great *Brittain* and *Ireland* *Annually* <sup>?</sup> but in one Furnace, that makes Fifteen Tun *per* Week of Pig-Iron for Forty weeks: I shall give you the Table, and leave you to judge of the rest of the Furnaces.

15. Tun <i>per</i> week		<i>Charcole,</i>	<i>Wood,</i>
spends of		30 loads	60 loads.

<i>Per Annum</i> 40		1200	2400 loads.
weeks spends			

Also for one Forge that make Three Tuns of Bar Iron weekly for Fifty weeks, but some Forges make double my Proportion, and spend to Fine and Bar out each

each Tun three Loads of Coles : To each Tun.

3 Tun <i>per</i> week Charcole		Wood
	9 Loads	18 loads
<i>Per Annum</i>	450 loads	900 loads

By these Examples, may you see, the vast quantities of Charcole, or Wood, that the 300 Furnacis spend weekly, or yearly, and the 500. Forges workings all the year, spend little lesse then the Furnaces: It being impossible, after this rate for great *Brittain* or *Ireland*, to supply these her works with Charcole in Fining of Iron at the Fineries, yet the Forges that need but half the Charcole may be permitted to use Charcole, and may be supplied with under Woods.

Let us but look back unto the making of Iron, by our Ancestors, in foot blasts, or bloomenies, that was by men treading of the Bellows, by which way they could make but one little lump or bloom of Iron in a day, not 100 weight, and that  
not

not fusible, nor fined, or malliable, until it were long burned and wrought under Hammers, and whose first slag, sinder or scorius, doth contain in it as much, or more Iron, then in that day the workman or bloomer got out, which Slag, Scorius, or Sinder is by our Founders at Furnaces wrought again, and found to contain much Yron and easier of Fusion than any Yron stone or Mine of Yron whatsoever of which slag and Sindere, there is in many Countryes Millions of Tuns and Oaks growing upon them, very old and rotten.

The next invention was to set up the Bloomeries that went by water, for the ease of the men treading the bellows, which being bigger, and the waterwheel causing a greater blast, did not onely make a greater quantity of iron, but also extracted more iron out of the slag or sinder, and left them more poorer of iron then the foot-blasts, so that the Founders cannot melt them again, as they do the  
foot-blast

foot blast sinders to profit: Yet these Bloomeries by water (not altogether out of use) do make in one day but two hundred pound weight of iron, or thereabouts neither is it fusible, or malliable, but is unfin'd untill it be much bürned, and wrought a second time in fire.

But some of the now going Furnaces with Charcole, do make two or three Tun of Pigg or cast iron in 24 hours.

Therefore *I* do not wholly compute the vast quantities of charcoles and wood spent in these voragious works, which quantity of cast iron, with pit-cole and Sea-cole, at one Furnace *I* desire not, but am contented with half the proportion, which once *I* attained unto before my Bellows were riotously cut, that is one Tun in 24 hours; we need not a greater quantity, if the like quantity were made in Furnaces in *Scotland*, and *Wales*, which abounds with Pit-cole and Sea-cole, as well as *England*; and our supernumery Smiths, Founders, and Forgemen, and  
other

other Tradesmen might be there imployed, thereby to furnish His Majesties Plantations, as well, if not better then *England*, where Coles are far cheaper then in *England*.

Although vast quantities of Coles do abound near the Authors dwelling, yet twenty thousand Smiths or Naylor at the least dwelling near these parts, and taking of Prentices, have made their Trade so bad, that many of them are ready to starve and steal; so that it is wished there were some courses taken to mend their Trade, imploy them in other parts, or permit them, not to take so many Prentices, all which have great occasions to use Pit-cole, and had not these parts abounded with cole, it would have been a great deal worse with them !then it is; but of the cole there is, nor will be any want, nor of iron-stone.

The manner of the cole-veins, or measures in these parts, and also of the measures of iron-stone, or mines, how they lye,

[54]

lye, be, or increase, some veins lye circuler, some sami-circuler, some ovall, some works almost in a direct line, and some works parts of a Circle; as by the Circle, it being onely for a small Example to judge the rest of the Mines by may appear.

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*F I N I S.*

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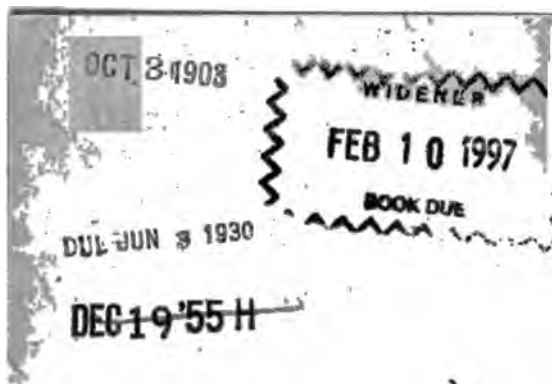








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